

CLAIMS

What is claimed is:

1 1. A method for draining fluid from the posterior chamber of the eye of
2 a human or veterinary patient, said method comprising the step of:

3 A. creating a passageway between the posterior chamber of
4 the eye and either i) a location within the optic nerve or ii) a location within
5 the subarachnoid space.

1 2. A method according to Claim 1 wherein Step A is carried out by
2 implanting a tubular shunt such that fluid from the interior of the eye will enter
3 one end of the shunt and said fluid will exit the other end of the shunt either i)
4 at a location within the optic nerve or ii) at a location within the subarachnoid
5 space.

1 3. A method according to Claim 2 wherein the shunt comprises a tube
2 having a proximal end, a distal end and least one tissue engaging member
3 formed on the shunt to deter unwanted movement of the shunt after it has
4 been implanted.

1 4. A method according to Claim 3 wherein the at least one tissue
2 engaging member comprises a barb or barb like structure that allows the
3 shunt to be advanced through tissue in a distal direction but engages the
4 tissue in a manner that deters subsequent retraction of the shunt in a
5 proximal direction.

1 5. A method according to Claim 2 wherein the shunt comprises a tube
2 having a proximal end, a distal end and a flange member formed on the
3 proximal end thereof.

- 1 6. A method according to Claim 2 wherein the shunt comprises a tube
2 having a valve associated therewith, said valve being operative to perform at
3 least one valving function selected from the group consisting of a) allowing
4 fluid to flow out of the eye but deterring fluid from backflowing into the eye
5 and b) allowing fluid to flow out of the eye only when the fluid pressure
6 exceeds a predetermined maximum pressure.
- 1 7. A method according to Claim 2 wherein the shunt comprises a tube
2 having a proximal end, a distal end and at least one shielding member
3 associated therewith to deter foreign matter or cells from clogging the tube.
- 1 8. A method according to Claim 7 wherein the shielding member
2 comprises a semi-permeable membrane constructed and positioned such
3 that fluid flowing out of the distal end of the tube will diffuse outwardly
4 through the membrane but foreign matter and cells will not diffuse inwardly
5 through the membrane and into the distal end of the tube.
- 1 9. A method according to Claim 1 wherein Step A comprises forming
2 an opening in the lamina cribosa.
- 1 10. A method according to Claim 2 wherein the shunt comprises a tube
2 having a distal tip that is configured to penetrate through tissue.
- 1 11. A method according to Claim 1 wherein the method further
2 comprises the performance of a vitrectomy procedure prior to, concurrently
3 with or after the performance of Step A.
- 1 12. A method according to Claim 1 wherein the method further
2 comprises liquefaction of at least a portion of the vitreous humor prior to,
3 concurrently with or after the performance of Step A.
- 1 13. A method according to Claim 12 wherein liquefaction of at least a
2 portion of the vitreous humor is accomplished by administering to the patient

3 a therapeutically effective amount of an agent that causes vitreal
4 liquefaction.

1 14. A method according to Claim 13 wherein the agent that causes
2 vitreal liquefaction is selected from the group consisting of:

3 urea;
4 urea derivatives;
5 compounds having urea groups;
6 hyaluronidase; and
7 other enzymes that cause vitreal liquefaction.

1 15. A method according to Claim 2 wherein Step A further comprises:
2 forming an opening in the pars plana;
3 advancing the shunt through the pars plana opening,
4 through the posterior chamber of the eye and into the optic nerve or
5 lamina cribosa.

1 16. A method according to Claim 15 wherein the shunt has a proximal
2 opening, a distal opening and a lumen and wherein the shunt is
3 advanced to a location where its proximal opening is positioned so
4 as to receive fluid from the posterior chamber of the eye and its
5 distal opening is positioned to allow said fluid to drain into the optic
6 nerve or subarachnoid space.

1 17. A method according to Claim 2 wherein the shunt is initially
2 positioned within a cannula that has an open distal end and
3 wherein Step A comprises:
4 inserting the cannula into the eye;
5 positioning the distal end of the cannula adjacent to the
6 lamina cribosa;
7 advancing the shunt from the cannula into the optic nerve;
8 and
9 removing the cannula while leaving the shunt implanted
10 within the eye such that the shunt will drain fluid from the posterior

11 chamber of the eye into either the optic nerve or the subarachnoid
12 space.

1 18. A method according to Claim 17 wherein a pusher is positioned in
2 the cannula behind the shunt and wherein the step of advancing the shunt
3 from the cannula into the optic nerve comprises advancing the pusher so as
4 to push the shunt out of the open distal end of the cannula.

1 19. A method according to Claim 2 wherein the shunt device is
2 configured to extend through the vitreous body such that aqueous humor
3 will drain through the shunt and into either the optic nerve or the
4 subarachnoid space.

1 20. A method according to Claim 2 wherein the shunt is configured to
2 bypass the posterior chamber and vitreous cavity of the eye:

1 21. A method according to Claim 20 wherein the shunt device extends
2 through a subconjunctival or subcleral tunnel.

1 22. A shunt device for draining fluid from the posterior chamber of the
2 eye into the optic nerve or subarachnoid space, said device comprising:
3 a tube having a proximal end, a distal end and a lumen extending
4 longitudinally therethrough;
5 a substantially conical tip member on the distal end of the tube;
6 a plurality of openings formed in the substantially conical tip
7 member to allow fluid to drain out of the lumen of the tube; and
8 at least one tissue engaging member configured to allow the shunt
9 to be advanced, tip member first, into tissue but to engage said tissue in
10 such a manner as to subsequently deter retraction of the shunt out of the
11 tissue.

1 23. A shunt device according to Claim 22 further comprising a one way
2 valve that allows fluid to flow in only one direction through the lumen of the
3 tube.

1 24. A shunt device according to Claim 22 further comprising a shielding
2 member which deters foreign matter or cells from clogging the tube.

1 25. A shunt device according to Claim 24 wherein the shielding
2 member comprises a semi-permeable membrane constructed and positioned
3 such that fluid flowing out of the openings formed in the tip member will
4 diffuse outwardly through the membrane but foreign matter and cells will not
5 diffuse inwardly through the membrane and into the lumen of the tube.

1 26. A shunt device according to Claim 22 further comprising a flange
2 member on the proximal end of the tube.

1 27. A shunt device according to Claim 22 that is at least partially
2 formed of material selected from the group consisting of:
3 silicon;
4 polyethylene;
5 polypropylene;
6 polycarbonate;
7 stainless steel; and
8 other biologically compatible material.

1 28. A shunt device according to Claim 22 wherein the tube is
2 configured to extend through the vitreous body, thereby providing for
3 drainage of aqueous humor through the vitreous body and into either the
4 optic nerve or the subarachnoid space.

1 29. A shunt device according to Claim 22 wherein the tube is
2 configured to extend through a subconjunctival or subcleral tunnel, thereby
3 bypassing the posterior chamber and vitreous cavity.

1 30. A system comprising a shunt device according to Claim 22 in
2 combination with a cannula, said shunt device being initially positioned within
3 the cannula and subsequently advanceable out of the cannula.

- 1 31. A system according to Claim 30 further comprising a pusher that is
- 2 insertable into the cannula to push the shunt device out of the cannula.